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Progress Report for August 1962

EVALUATION OF REGENERATIVE FUEL CELL

Prepared for

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1. FUEL CELL ASSEMBLY

A minor modification was made to the fuel cell assembly described in Report 3310-ML-1, last month. A hole was drilled which connected the O-ring groove with the hydrogen storage compartment, for the purpose of eliminating the pressure differential between the groove and the remainder of the system.

A new fuel cell subassembly was also built which will allow the silver oxide assembly to be replaced with one for oxygen for some later experiments. This differs from the silver oxide subassembly by incorporating an oxygen storage cylinder with a capacity half that of the hydrogen cylinder. In order to exactly balance the pressures, a pressure equalizer has been built. However, during assembly, the diaphragm, which is aluminum coated Mylar, was damaged by a KOH solution and will have to be replaced. This pressure equalizer may also prove to be necessary with high pressure experiments on the hydrogen-silver oxide cell.

2. ELECTRODE FABRICATION

During the past month, more than a dozen different kinds of silver oxide electrodes and two different kinds of hydrogen electrodes have been made. A few silver electrodes doped with nickel or cadmium have been made and several more will be made in the near future. Some Raney silver electrodes have been made but none have yet been tested. Of those which have been doped, some have been doped from the alloyed metals and two have been doped by the coprecipitation method, as described last month. The doped electrodes made in the future will be restricted almost entirely to those made by the coprecipitation method because of the difficulty in pulverizing some of the soft alloys.

3. INSTRUMENTATION

All of the instrumentation has not yet been completed. The multi-channel recorder is being modified slightly for the present work, and extra parts are being procured.

An automatic cut-out device has been added to the circuit to prevent the cell from becoming charged backwards. The constant current power supply maintains a constant current of preselected value and in a preselected direction through the fuel cell. If, on discharge, this current exceeds the limiting current of the fuel, then the cell will "go negative" and become charged but with a polarity opposite to that of the normal charging mode. The cut-out takes the fuel cell out of the circuit when its potential on discharge drops below a pre-set value, usually from 0.1 to 0.3 volt.

4. RESULTS FOR THE MONTH OF AUGUST

Limited testing of new electrodes was done during the past month, but a considerable amount of electrode fabrication was accomplished. Some refinements to the instrumentation were made and an oxygen sub-assembly was made for some later work. The electrode testing which was done was of an exploratory nature to screen out some unsatisfactory oxygen and silver oxide electrodes. A preliminary evaluation of palladium black in place of platinum for both hydrogen and oxygen electrodes was also made. Preliminary results indicate that palladium is not quite as good as platinum.

5. FUTURE PLANS

It is anticipated that a major amount of electrode testing will be done during the latter part of September. Resistivity measurements of silver oxide and several doped silver oxides will be made. Preliminary studies for this latter work have already been started.